Analysis of the California ARB's Scoping Plan and Related Policy Insights

April 21, 2010

Paul Bernstein

CRA Charles River Associates

This work was performed at the invitation of and in collaboration with the California Air Resources Board in response to Resolution 08-47 with the goal of better understanding the sensitivity of economic impact estimates to methodologies, assumptions, and policy measures

Summary – Comparison of ARB and CRA Findings

- Estimates of overall impacts in 2020 vary greatly depending on the treatment of complementary measures, offsets, and technology cost assumptions:*
  - Allowance prices range from $50 to $80 per metric ton of CO_2 ($0.50 to $0.80 per gallon of gasoline)
  - Cost per household ranges from $200 to $500 per capita (0.5% to 1.1% of income per capita)
  - When comparing a case with limited complementary measures, Case 5, ARB finds 2020 per capita costs of $270 vs. CRA's cost estimate of $290

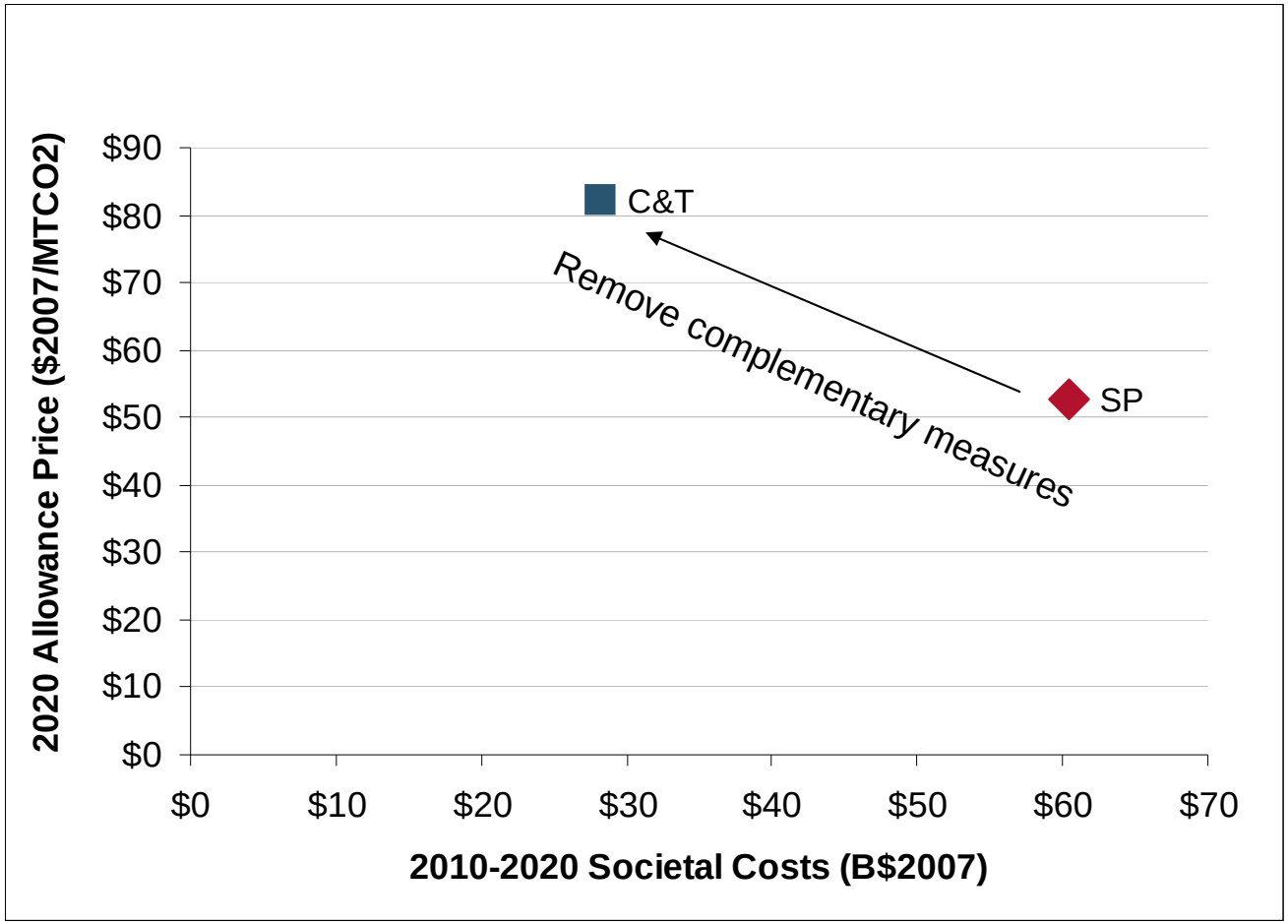
- CRA and ARB both find even 4% offsets significantly reduce costs of meeting an emissions target with permit prices reduced by between 33% (CRA) and 80% (ARB)

- CRA and ARB differ in how command and control measures affect policy costs: CRA finds that measures that reduce flexibility (i.e., "complementary measures"), increase costs of complying with AB32; whereas ARB finds these measures reduce costs

- CRA's and ARB's models are sensitive to assumptions about economic forecasts, technology costs and development so flexibility in policy design is critical
  - Accounting for likely higher costs of procuring and delivering low carbon fuels to the California fleet raises the costs of complying with the LCFS and increases the cost of the overall program by over 40%
  - Costs are significantly less under the IEPR 2009 emissions forecast, than under the 2008 Scoping Plan, which used the IEPR 2007 emissions forecast

*All numbers in 2007$s.

Excluding complementary measures cuts program costs by 50%



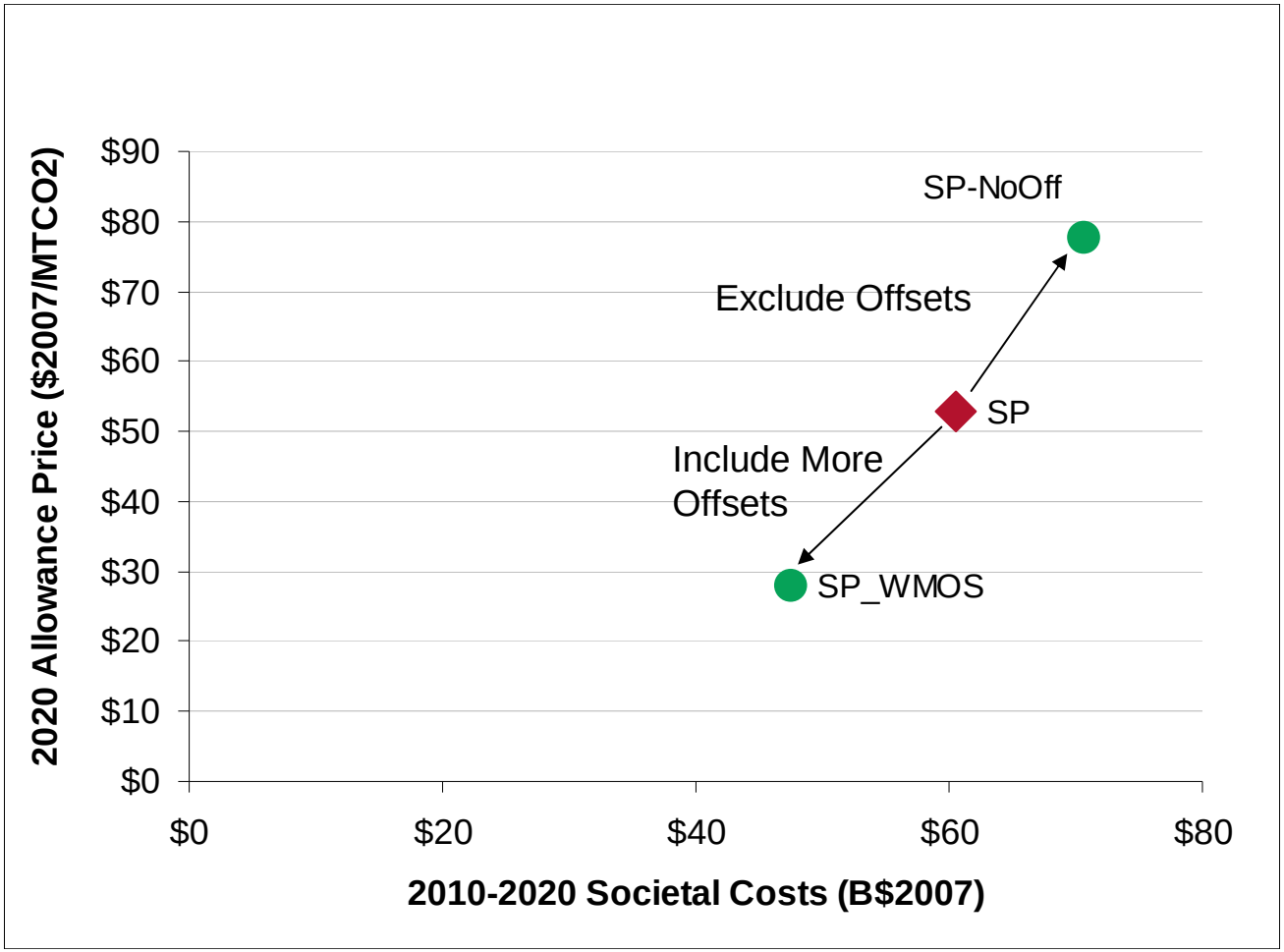
- Overall policy costs cannot be inferred from the CO_2 allowance price because AB32 combines a market-based program to reduce carbon emissions (*e.g.*, cap-and-trade) with command-and-control mandates (*e.g.*, the complementary measures).

- Achieving the same cap, the complementary measures prescribe more expensive carbon emission reductions than the cap-and-trade program alone, resulting in lower allowance prices, but higher total compliance costs.

	SP (Case 1)	C&T
All Complementary Measures	Included	Excluded

CRA Charles River Associates

Allowing offsets mitigates costs of AB32

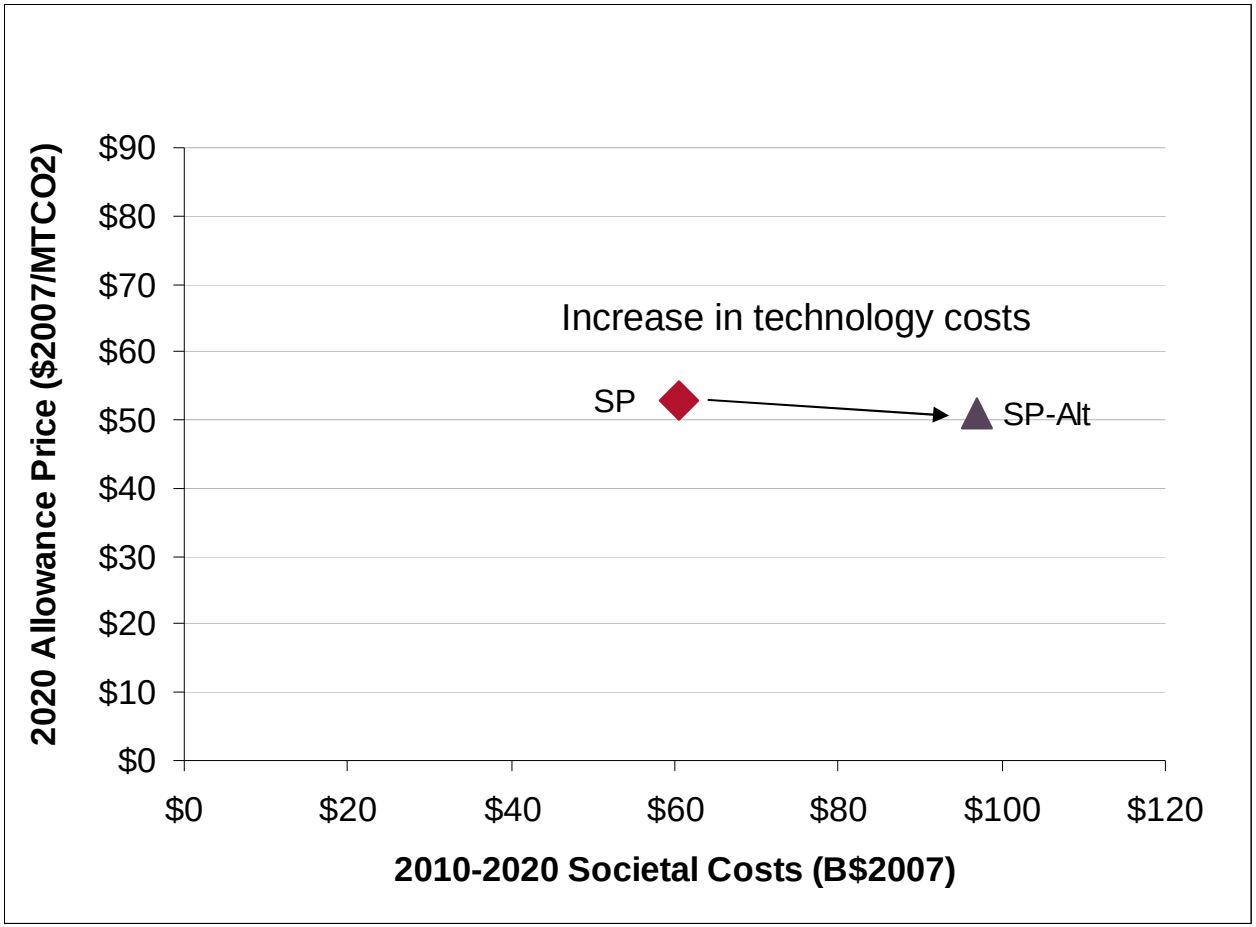


- Allowing use of more offsets from a broader range of sources can cut costs by a third while preserving emission reductions
- Flexible mechanisms are valuable for mitigating cost increases due to higher than expected emissions and technology costs
- Offsets lessen incentives for investment to leave California by lowering allowance prices

	SP (Case 1)	No Offsets (Case 2)	Waxman-Markey Offsets
Complementary Measures	Included	Included	Included
Offsets in 2020 (MMTCO2) or (%)	4%	None	50

CRA Charles River Associates

Results are sensitive to assumptions about costs of new technologies



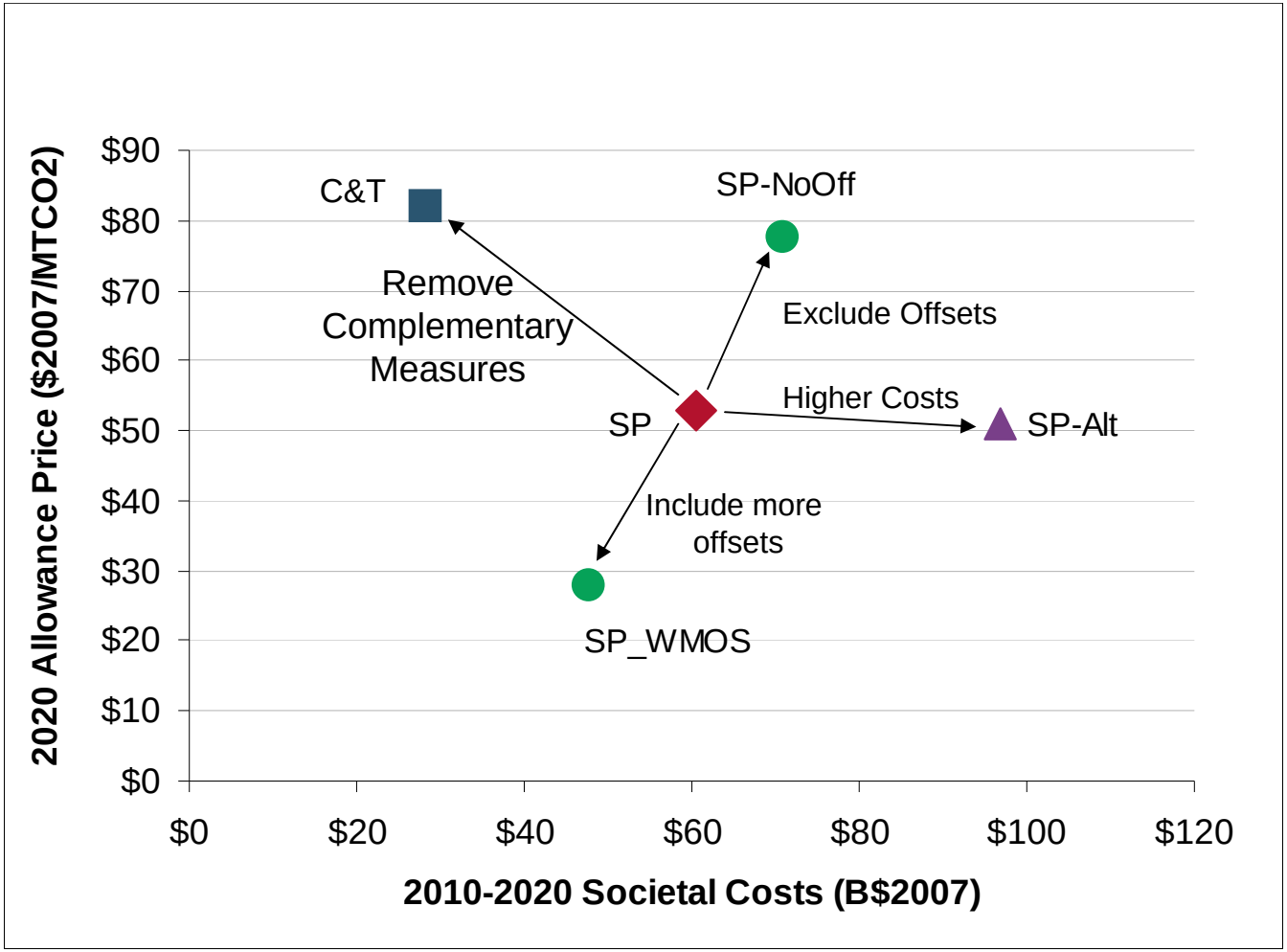
- Accounting for likely higher costs of procuring and delivering advanced low carbon fuels to the California fleet adds $40 billion dollars to the overall program costs

- Excluding or reducing the stringency of complementary measures reduces the sensitivity of program costs to technology uncertainty because the market is no longer constrained in its choice of technologies

	SP (Case 1)	SP-Alt
Complementary Measures	Included	Included
Cost Assumptions	ARB	CRA

CRA Charles River Associates

Summary of sensitivities



	SP (Case 1)	C&T	SP-Alt	SP-NoOff (Case 2)	SP_WMOS
Complementary Measures	Included	Excluded	Included	Included	Excluded
Cost Assumptions	ARB	ARB	CRA	ARB	ARB
Offset Availability	4%	4%	4%	None	WM

Conclusions – The Analysis Shows:

- Increased reliance on a market-based approach, e.g., cap-and-trade, can achieve the emission target at substantially lower cost than the Scoping Plan's approach that relies heavily on complementary measures
  - Policy design choices have an important impact on total costs

- Including offsets reduces permit prices and overall program costs while maintaining overall emission reductions
  - 4% offsets lower program costs and permit prices by 15% and 33%, respectively
  - Increasing availability of offsets from 4% to the amount prescribed by the Waxman-Markey bill lowers program costs and permit prices further by another 15% and 33%

- External factors can also contribute to higher than expected costs, highlighting the need for compliance flexibility and cost containment mechanisms
  - Higher than expected emissions and technology costs would increase program costs substantially. For example, higher alternative fuel costs greatly increase the costs of complying with the LCFS.

- Replacing or linking AB32 with a national cap and trade program could lower costs by 50% and achieve similar contributions to global emission reductions in the long run

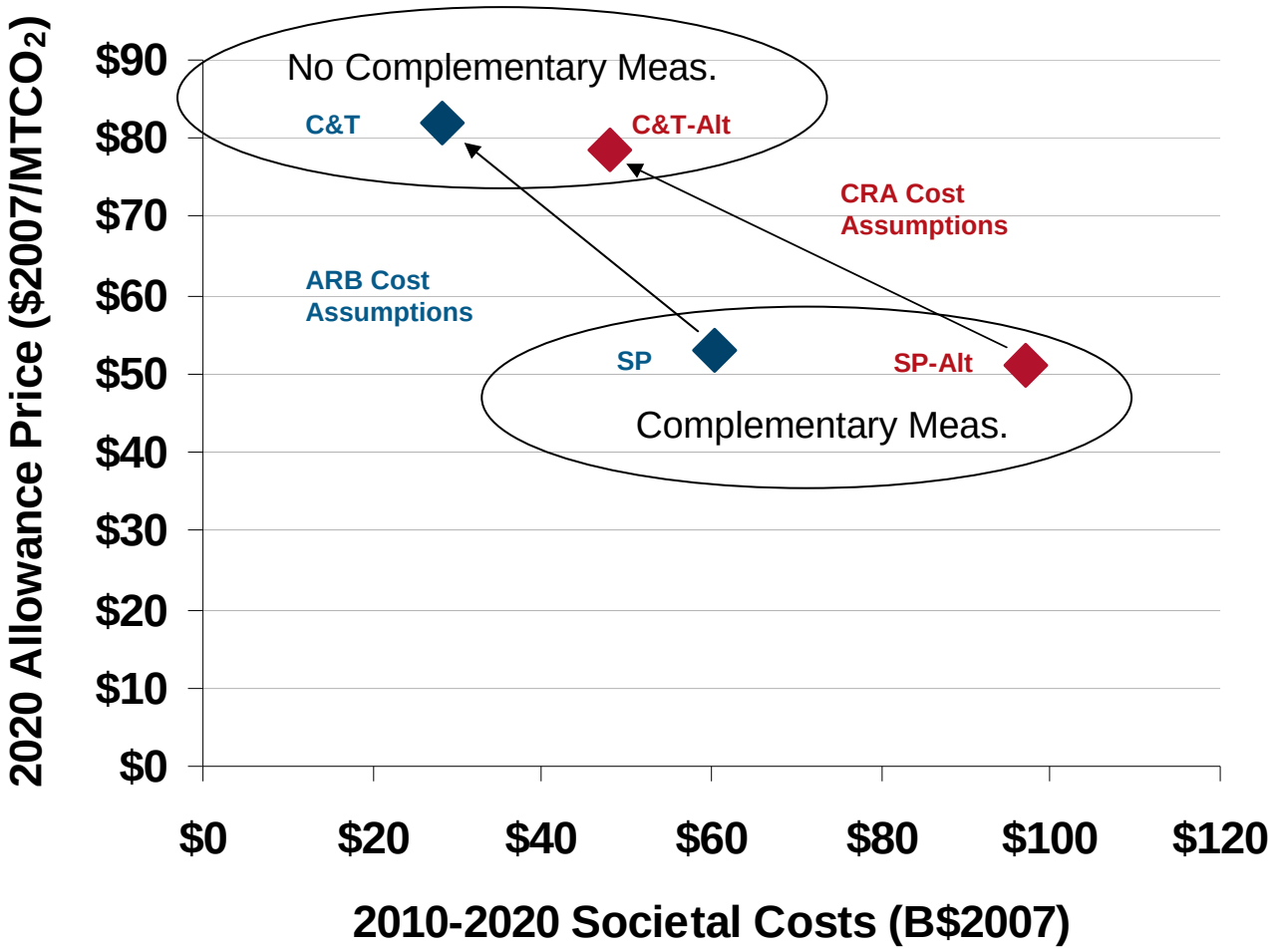
Thank You

For more details on this study, please see:
http://www.crai.com/uploadedFiles/analysis-of-ab32-scoping-plan.pdf

For media inquiries, please contact:
Andrea Goodman at (617) 425-3333 or at agoodman@crai.com

Backup Slides

Excluding complementary measures cuts program costs by 50%



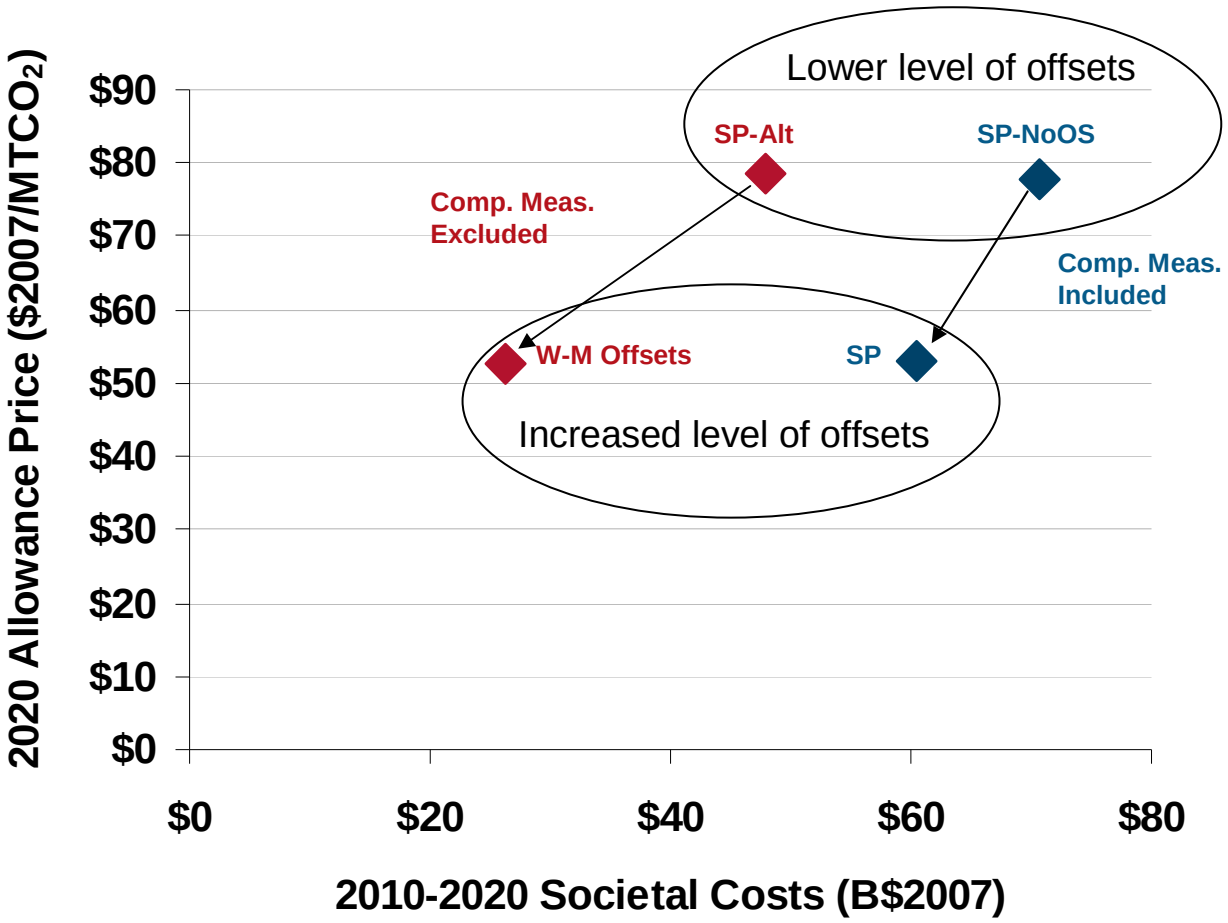
- Overall policy costs cannot be inferred from the CO2 allowance price because AB32 combines a market-based program to reduce carbon emissions (*e.g.*, cap-and-trade) with command-and-control mandates (*e.g.*, the complementary measures)

- Under either CRA or ARB assumptions, the complementary measures prescribe more expensive carbon emission reductions than cap-and-trade program alone, resulting in lower allowance prices, but higher total compliance costs.

	SP (Case 1)	C&T	SP-Alt	C&T-Alt
Complementary Measures	Included	Excluded	Included	Excluded
Cost Assumptions	ARB	ARB	CRA	CRA

CRA Charles River Associates

Offsets reduce costs of AB32 implementation by $7 to $24 billion and allowance prices by about $25/MTCO$_2$

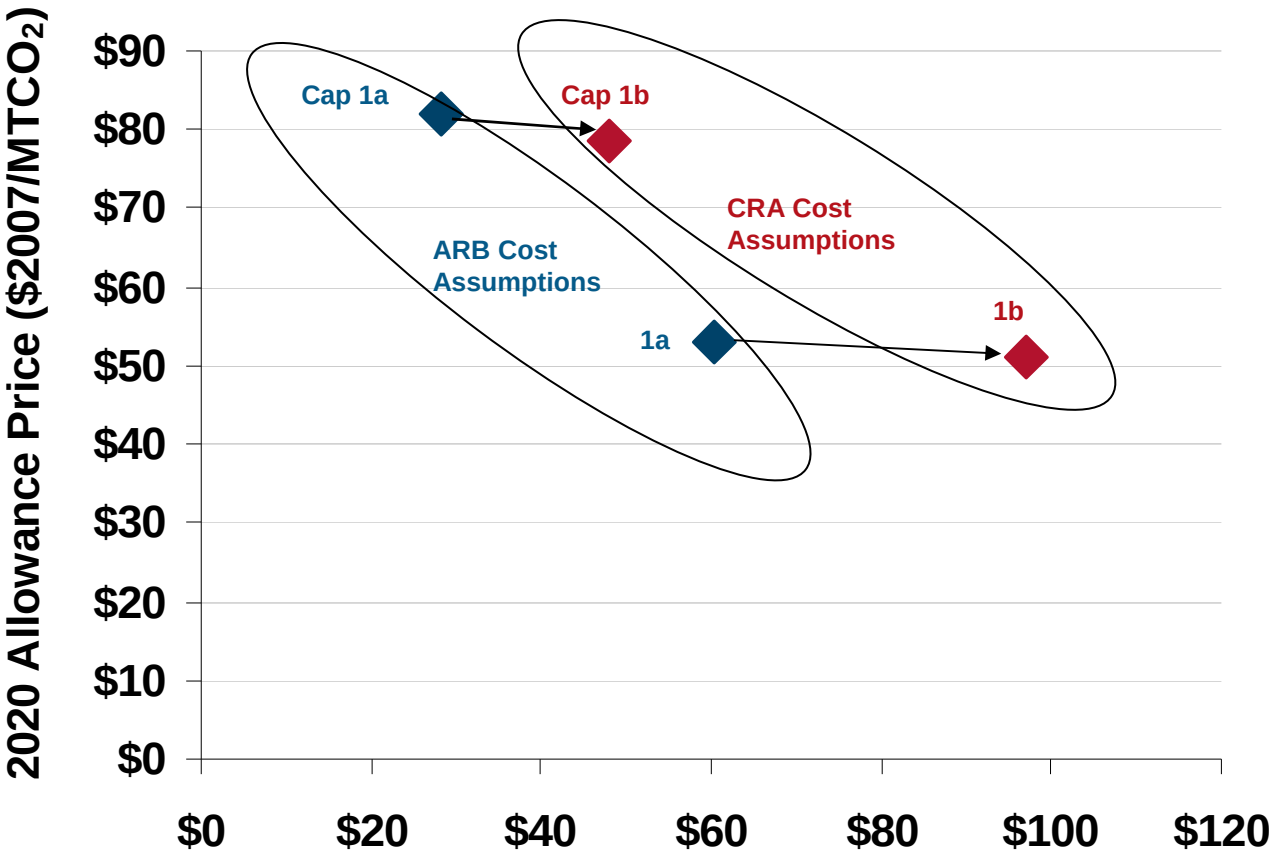


- Allowing use of more offsets from a broader range of sources can cut costs in half while preserving emission reductions
- Flexible mechanisms are valuable for mitigating cost increases due to higher than expected emissions and technology costs
- Offsets lessen incentives for investment to leave California by lowering allowance prices

	SP (Case 1)	SP-NoOS (Case 2)	Waxman-Markey Offsets	SP-Alt
Complementary Measures	Included	Included	Excluded	Excluded
Offsets in 2020 (MMTCO2) or (%)	4%	None	55	4%

CRA Charles River Associates

Cost of complementary measures more sensitive to technology costs than pure cap and trade program



- Accounting for likely higher costs of procuring and delivering advanced low carbon fuels to the California fleet adds $20 to $40 billion dollars to the overall program costs

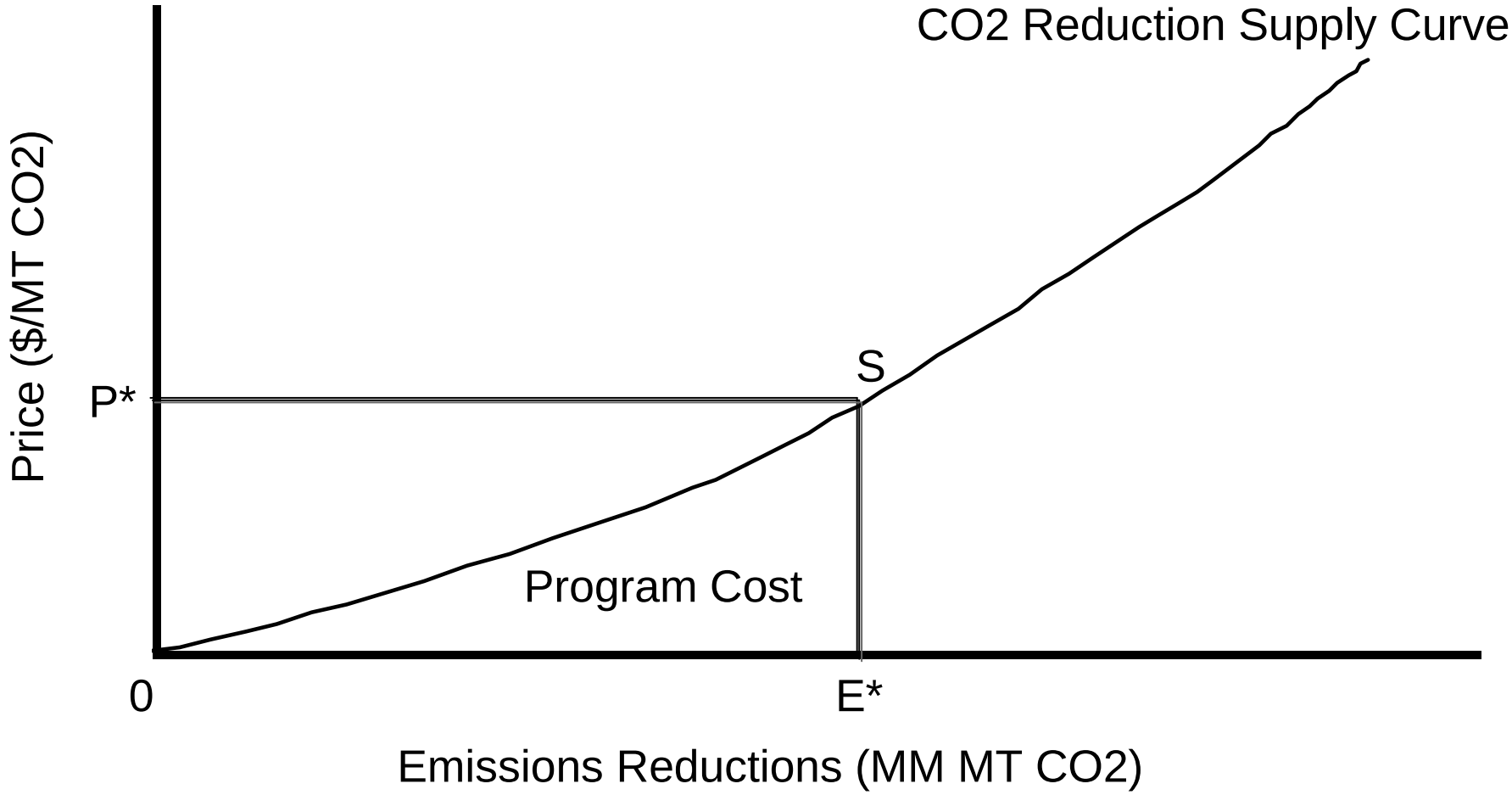
- When complementary measures are excluded program costs are less sensitive to technology uncertainty because the market is no longer constrained in its choice of technologies

2010-2020 Societal Costs (B$2007)

	SP (Case 1)	C&T	SP-Alt	C&T-Alt
Complementary Measures	Included	Excluded	Included	Excluded
Cost Assumptions	ARB	ARB	CRA	CRA

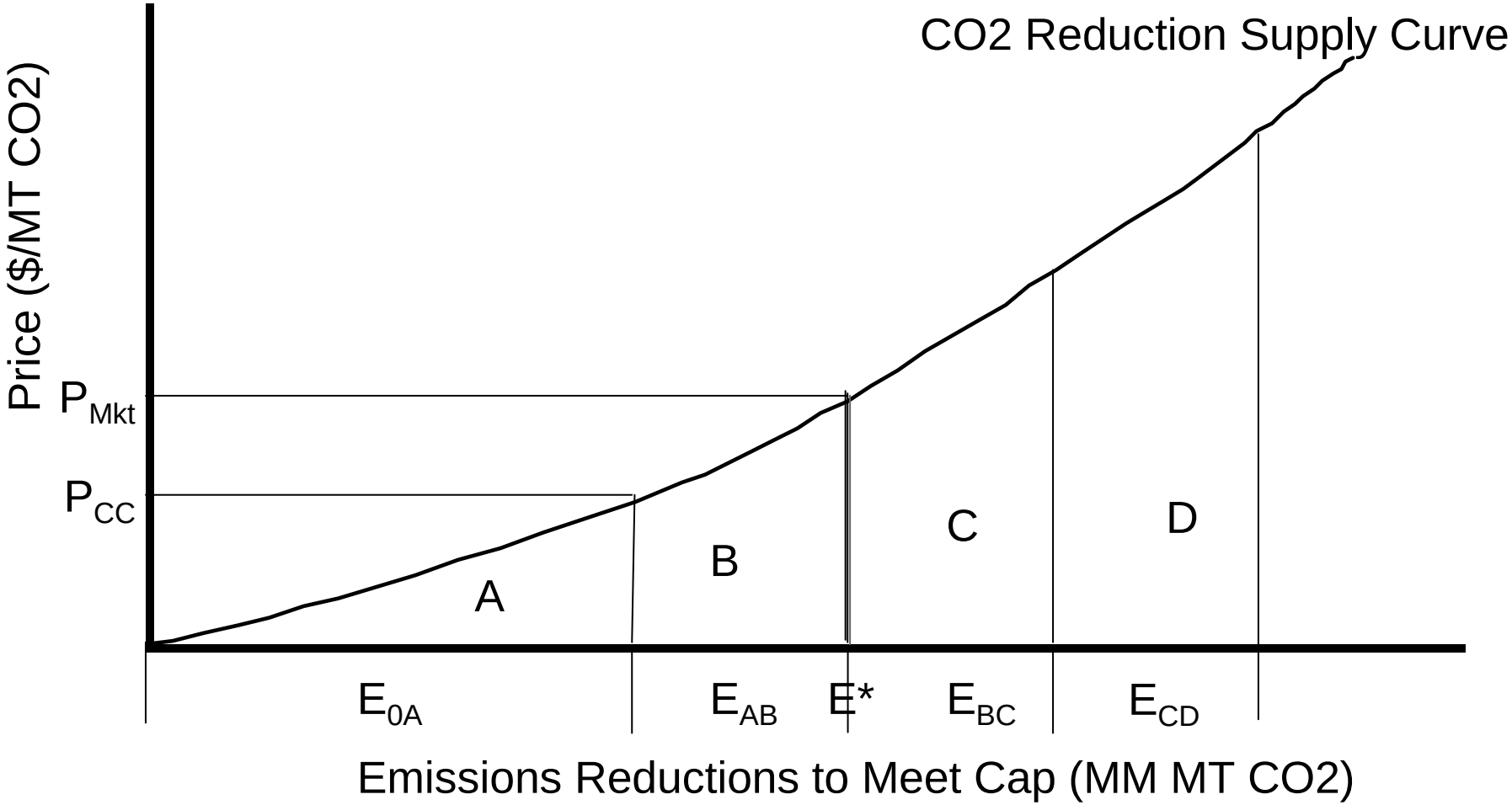
CRA Charles River Associates

CO2 Reduction Supply Curve



E* = Emission reductions needed to meet cap
P* = Permit price for E* reductions
Program Cost = The area defined by 0SE*

Command and Control Programs Raise Costs and Lower Permit Prices



C & D represent command and control measures

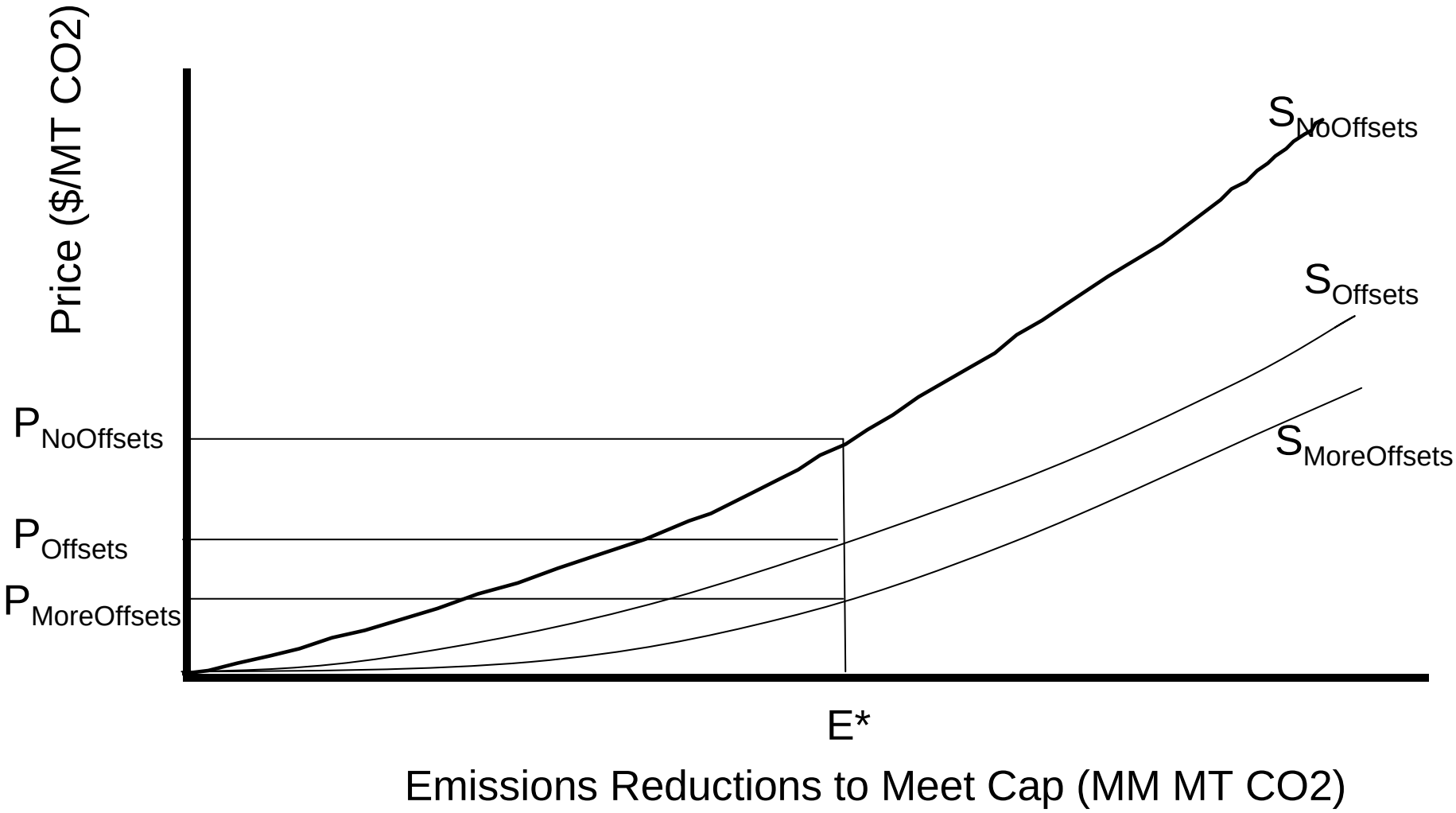
$E_{AB} = E_{BC} = E_{CD}$

Cost under efficient policy = A+B; Permit price = P_{Mkt}

Cost under C&C low cost = A+C; Permit price = P_{CC}

Cost under C&C high cost = A+D; Permit price = P_{CC}

Including Offsets Lowers Program Costs and Permit Prices



CRA Charles River Associates